Hallmark Tools, Capabilities and Evaluation Methodology (Hallmark-TCEM)

Space Enterprise Command and Control

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Hallmark-ST BAA Overview and Q&A Session

05 October 2016

Thank you for attending

This published BAA supersedes anything that may be discussed today.

https://www.fbo.gov/spg/ODA/DARPA/CMO/DARPA-BAA-16-49/listing.html
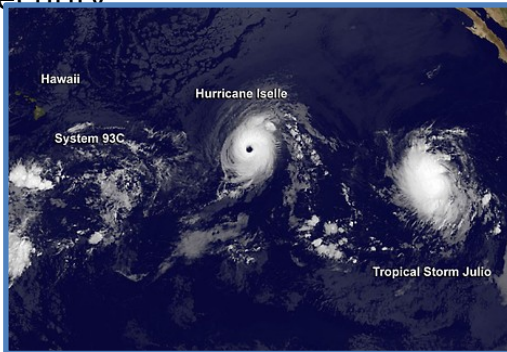
When in doubt, refer to the BAA.

Space: Critical, Crowded and Threatened

Space assets/services are increasingly critical

Relied upon across the DoD, the economy and the world for communications, surveillance, weather and security
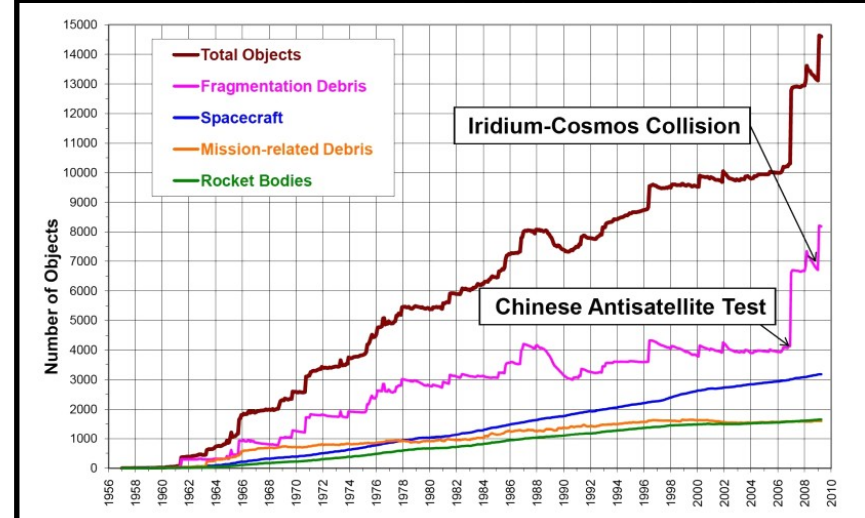

Deployed Tactical Comms

Hurricane warning and tracking

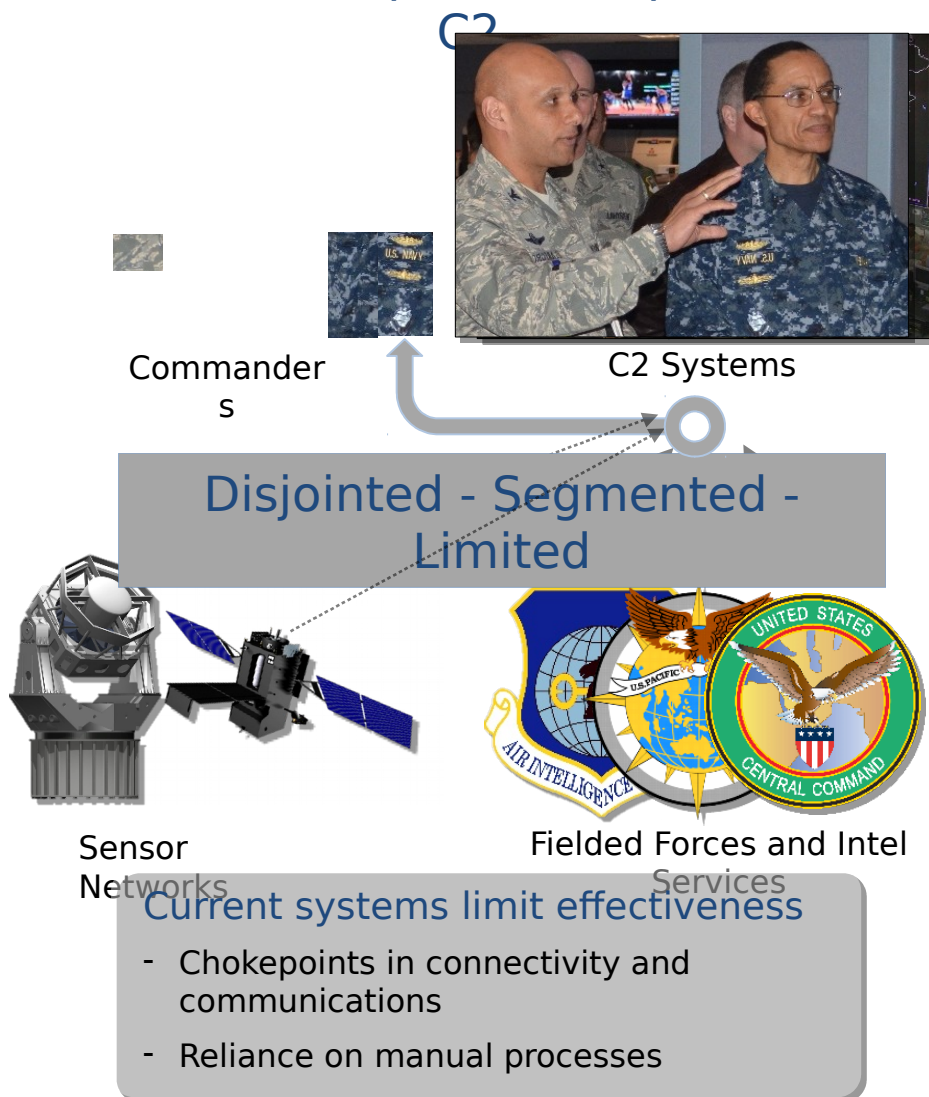UN Policy enforcement in the Sudan

Orbital congestion is increasing

- Total objects in orbit is increasing rapidly
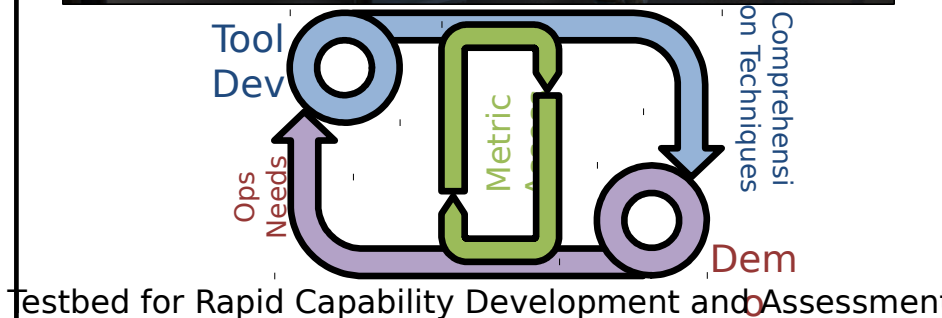- Cost of satellite placement is no longer prohibitive

Space Enterprise Command and Control

Fielded Space Enterprise C2

Commanders

C2 Systems

Disjointed - Segmented - Limited

Sensor Networks

Fielded Forces and Intel Services

Current systems limit effectiveness

- Chokepoints in connectivity and communications
- Reliance on manual processes

Future Space Enterprise C2

Artist's Concept

Tool Dev

Comprehension Techniques

Metric

Ops Needs

Dem

Testbed for Rapid Capability Development and Assessment
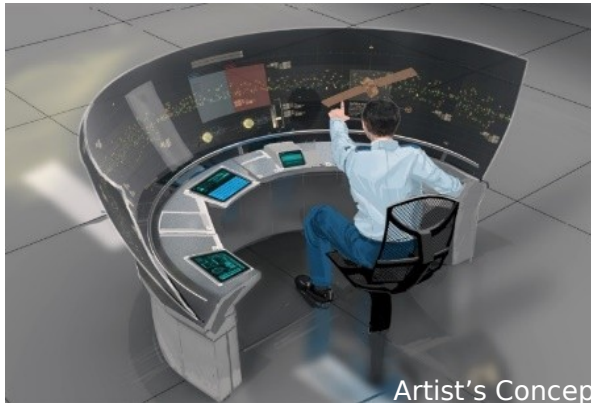
Hallmark enhances effectiveness

- Decision support
- Unified operating picture
- A testbed to build future tools evaluated by cognitive assessment metrics
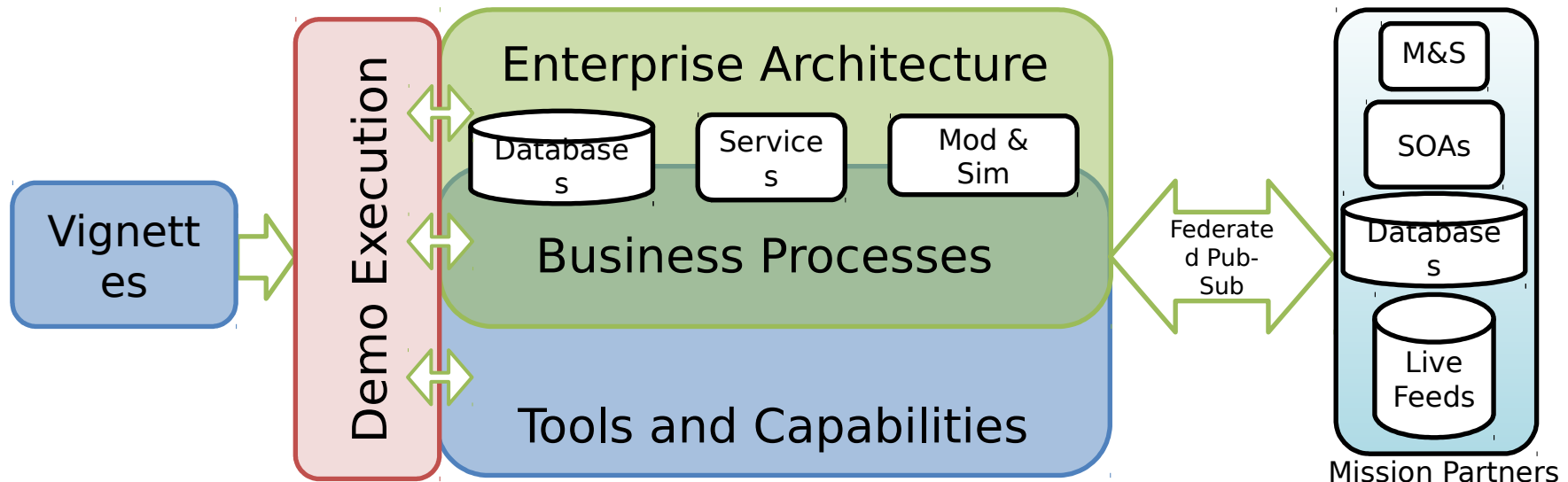
Revolutionize Space Enterprise

- Enhance decision making processes
- Improve understanding of the space domain
- Reduce operator workload to assemble options

Artist's Concept

Vignettes → **Demo Execution** ↔

Enterprise Architecture
- Databases
- Services
- Mod & Sim

Business Processes

Tools and Capabilities

↔ **Federated Pub-Sub** ↔

Mission Partners
- M&S
- SOAs
- Databases
- Live Feeds

Hallmark Structure: One Program with Two BAAs

BAA-16-40 Hallmark – Software Testbed
Scalable flexible service oriented enterprise architecture for integrating space C2 tools and capabilities

BAA-16-49 Hallmark – Tools, Capabilities, and Evaluation Methodology
- Technical Area 1: New tools, technologies and processes for enabling the full spectrum of military space enterprise C2 capabilities
- Technical Area 2: Processes and methodologies to support periodic, comprehensive evaluation of the integrated Hallmark system

- You can propose to TA1 and TA2 but DARPA will not award to a single corporate entity.
  - Do not submit proposals that combine TA1 and TA2 into a single effort.

- Proposers to BAA-16-40 who submit proposals to BAA-16-49 for TA1 are required to include an organizational conflict of interest (OCI) plan as part of their proposal
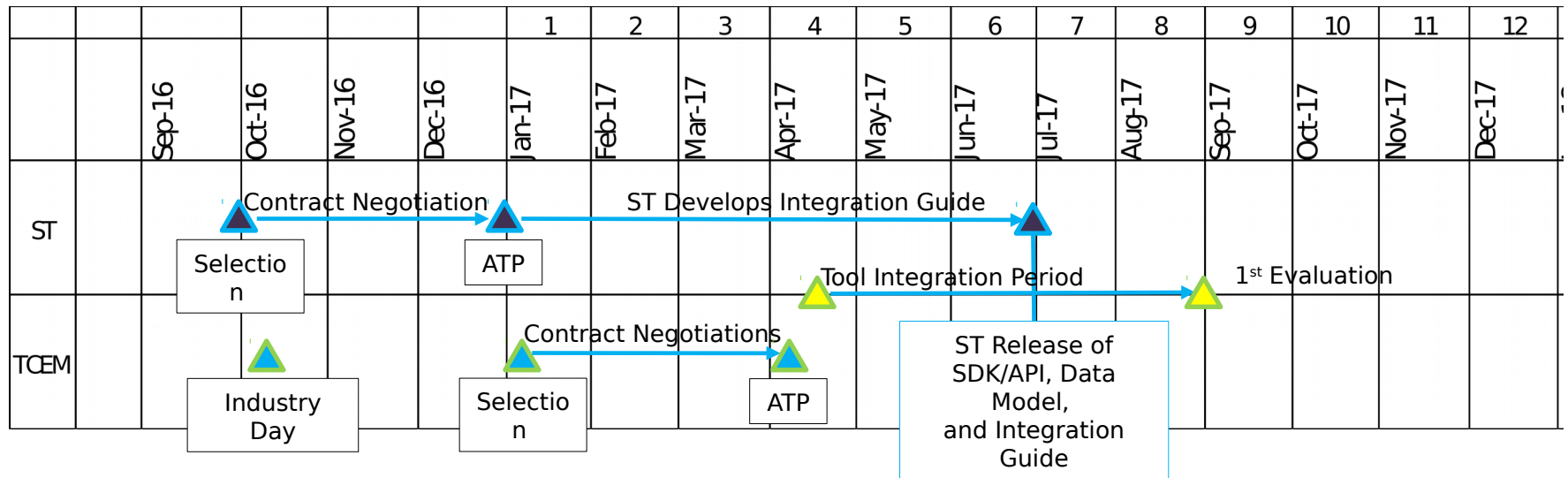
Deliverables from Hallmark-ST performer

Within six months of ATP the ST performer will deliver
- Hallmark SDK and API
- Hallmark-ST Integration Guide
- Draft Hallmark ontology and data model

Hallmark-ST will provide the Space Enterprise Analysis Capability
- Anticipated to be located in Northern VA
- Both an Integration capability and a Testbed Capability

					1	2	3	4	5	6	7	8	9	10	11	12	
	Sep-16	Oct-16	Nov-16	Dec-16	Jan-17	Feb-17	Mar-17	Apr-17	May-17	Jun-17	Jul-17	Aug-17	Sep-17	Oct-17	Nov-17	Dec-17	
ST	▲ Selection	Contract Negotiation			▲ ATP		ST Develops Integration Guide				▲		1st Evaluation				
TCEM		▲ Industry Day			▲ Selection	Contract Negotiations		▲ ATP	Tool Integration Period		ST Release of SDK/API, Data Model, and Integration Guide		▲				

What to expect from the Architecture Provider

- Flexibility - the ability to quickly and easily change attributes to accommodate varying user and mission requirements.

- Expandability - the ability to add new features and functions without system redesign.

- Scalability - the ability to increase or decrease the system capabilities to accommodate bigger or smaller requirements.

- Modular Composability - the ability to initialize and change the systems attributes by changing modules (hardware and/or software).

- Multiple classification levels – the ability to deal with data and data sources that exist at multiple classification levels and integrate that data with computational processes that will generate additional data at multiple classification levels.

Hallmark-TCEM Technical Area 1

The focus is to identify, develop, improve and consolidate tools that assist military space planners to build and exercise C2 space operations. TA1 performers will develop tools, approaches and algorithms to assist operations in creating a Unified Operating Picture.
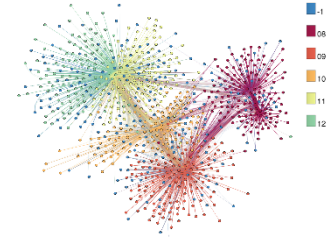
Space Enterprise Representation, Processing and Fusion
Integrated Data Representations
Data Fusion
Physics Models
Space Object Measurement and I
Pedigree of Information

Interactive Information Visualization
Interactive Exploration
"Drill-Down" Capabilities
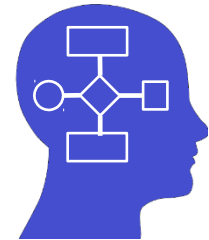Grounded in best practices

Indications and Warnings Functions
Fusion of multi-domain information
I&W Modeling and Simulation Tools
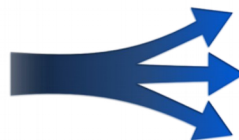Multi-modal/dimensional displays

Integrated Cognitive Engineering Approach to Design
Mental Models
Macro-cognitive Approaches
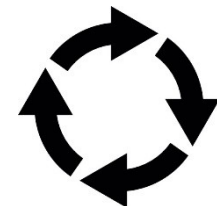Advanced Decision Making Models

COA Generation, Selection, Customization & Evaluation
COA representation
COA M&S tools
Combination, Customization and
Evaluation Techniques

Business Process Development
Address the vignettes
Anticipate data requirements
Understand Operator needs

Demonstration and Evaluation

- Demonstration events will occur on a regular cadence throughout each phase of the program.
- TA2 proposals should address how the proposed team will conduct cognitive analyses and assessments to enable measurable progressive TA1 and TA2 refinement along with the Hallmark architecture.
- Human Subject Research may be required; if so TA2 performers should collaborate with TA1 performers for Institutional Review Board approval
- Cognitive Engineering will be discussed in a subsequent separate briefing.

Phase I candidate metrics
- Successfully evaluate at least one threat scenario
- Floor operations leader understands the integrated COP
- Operational team provides recommendation with confidence level under ten hours

15 months

Phase II candidate metrics
- Successfully evaluate at least three scenarios in two orbital regimes
- Comprehension of at least three COAs per scenario
- Provide recommendation with confidence level under five hours
- Shared situational awareness (70% passes evaluation testing)
- Information confidence (70% information output is reliable)

15 months

Phase III candidate metrics
- Successfully evaluate at least six scenarios in all orbital regimes
- Comprehension of at least three COAs per scenario
- Provide recommendation with confidence level under 2.5 hours
- Shared situational awareness (90% passes evaluation testing)
- Information confidence (90% information output is reliable)

12 months

Hallmark-TCEM
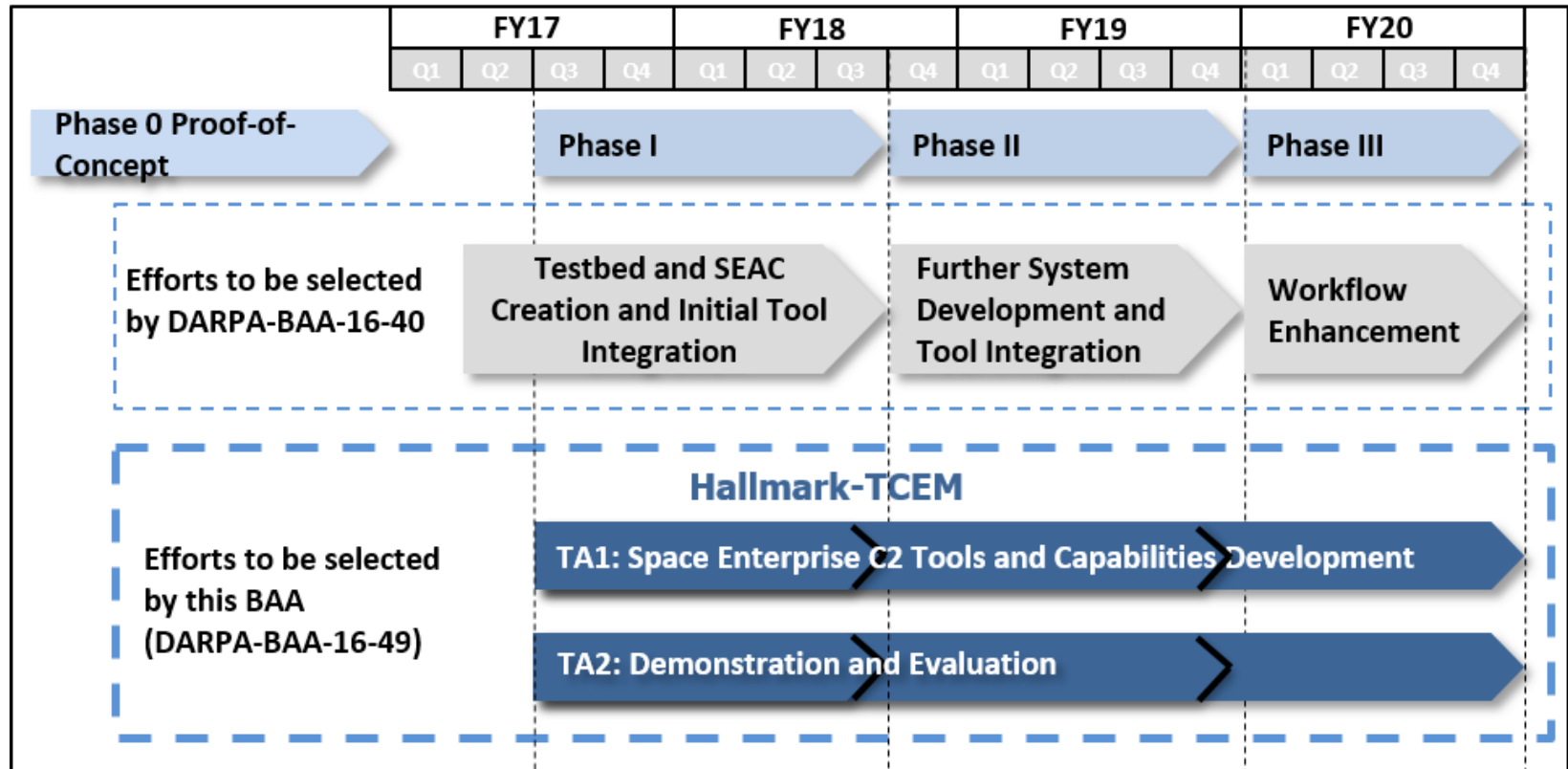
Proposal Evaluation

Proposals will be evaluated on the following criteria, listed in descending order

- Overall scientific and technical merit

- Potential contribution and relevance to the DARPA mission

- Realism of proposed schedule and cost

- Proposer's capabilities and/or related experience

- Complies with guidance of FAR 35.016(E):

    The primary basis for selecting proposals for acceptance shall be technical, importance to agency programs, and fund availability. Cost realism and reasonableness shall also be considered to the extent appropriate.

Proposals Should Avoid

- For TA1:
  - A technology-centric focus on the most advanced tools and automation without an understanding of the users' cognitive tasks towards requirements

- For TA2:
  - Focusing on quantitative measurement techniques to the exclusion of qualitative techniques, and vice versa
  - Focusing on task performance metrics to the exclusion of task process and situation understanding

- For both TA1 and TA2:
  - Underestimating the importance of cognitive engineering expertise
  - A lack of mission focus

Question and Answer Session